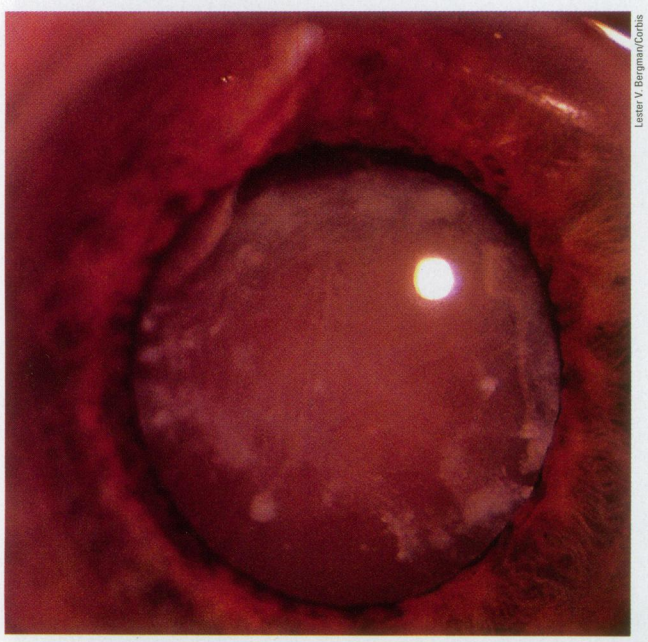
We've got a program to invent a new name for ecology, so we can keep it alive after it's been talked to death. We're thinking of calling it politics.
Harvey Wheeler
Newsweek, 26 January 1970

Cataract Development: It's Cumulative

Cumulative exposure to UV-B radiation in sunlight increases the risk of cataracts, even among a population with relatively low exposure throughout their lifetimes. This is the finding of a recent study by researchers at The Johns Hopkins University in Baltimore, Maryland, that was published in the 26 August 1998 issue of the *Journal of the American Medical Association.* Earlier studies had linked the risk of cataract development to high levels of sunlight exposure.

The Salisbury Eye Evaluation (SEE) project was a two-year study funded by the National Institute on Aging. The SEE project is the first to demonstrate that high levels of sunlight exposure are not necessary for cataract development, but that cumulative exposure over many years is a risk factor. The study also indicates a difference in risk for cataracts among whites and blacks.


Lester V. Bergman/Corbis

Don't stare into the sun. A new study shows that cumulative exposure to UV-B radiation in sunlight increases the risk of cataracts.

The study was conducted in Salisbury, Maryland. Salisbury was selected as the study site for a number of reasons. The moderate size of the town gave the researchers a manageable study cohort. In addition, the Johns Hopkins staff had already established a working relationship with Salisbury's ophthalmologists and optometrists, and the single local hospital allowed ready access to medical records if needed.

The researchers obtained a list of 3,821 individuals in Salisbury who were aged 65 and older. This list included 100% of Salisbury's black residents in that age group, 56% of the whites aged 65–74 years, and 62% of the whites aged 75 and older. Females made up 58% of the list. These potential subjects were first visited in their homes and asked to take a screening questionnaire. The questionnaire asked the participants about their sunlight exposure since the age of 30, both at work and during leisure activities, the geographic locations of their work and leisure activities, and whether they used glasses or hats while outside. They also were asked to assess their current level of vision on a scale of 1 (poor) to 10 (excellent).

Those participants who met study criteria were then asked to report to the SEE clinic to undergo dilation of the pupil and photographing of the lens. The researchers used an algorithm that considered the amount of sunlight exposure per day at a given time of day, the month of exposure, the fraction of time spent outdoors, and the use of hats and eyeglasses to calculate each subject's annual UV-B exposure. Exposure units were in Maryland sun-years (MSY), the equivalent of 75.9 joules of radiant energy per square centimeter of tissue. Of the 2,520 individuals who reported to the clinic, no differences were found in their average annual sunlight exposure, though women as a group tended to have less exposure (median 0.007 MSY) than men (median 0.019 MSY).

Blacks exhibited a significantly greater number of cortical cataracts than whites, even though sunlight exposure did not differ between the two groups. "There is a racial factor of some sort demonstrated here," says Sheila K. West, a professor at the Wilmer Eye Institute at Johns Hopkins and coauthor of the study. "We thought it might be associated with the greater prevalence of hypertension or diabetes among the black population, but after controlling for those factors the difference remained." She also notes that eye color, education, smoking, and alcohol use were not found to account for the difference. "Nevertheless," she says, "ours is the first study to document the relationship between ocular exposure to UV-B and risk of cortical opacity in African Americans."

Overall, for the older population of Salisbury, the risk for cortical cataracts resulting from cumulative exposure to UV-B was found to be 13%. This level of risk may well be unique to Salisbury, says West. One might expect the prevalence of such cataracts to be higher among a population living in areas of more intense sunlight occurring over longer periods of time. However, West notes, "People living in areas of intense sunlight may not stay out in the sun for long periods of time and are more accustomed to wearing sunglasses when they are out."

Robert Sperduto, chief of the Epidemiology Branch of the National Eye Institute, agrees. "It is likely that individual levels of exposure differ even in areas with greater amounts of sunlight, though earlier studies indicate a higher prevalence of cataracts in areas with more sunlight," he says.

No association was found between UV-B exposure and other types of cataracts, such as nuclear or posterior subcapsular opacities. Extrapolation of these test results is moot, however, inasmuch as no similar studies have been carried out in other areas.

Fortunately, cortical lens opacities are easily preventable, the researchers say. Simply wearing plastic lenses, tinted or not, or a wide-brimmed hat can significantly reduce the incidence of these cataracts. Some manufacturers are now treating contact lenses to block UV-B radiation.

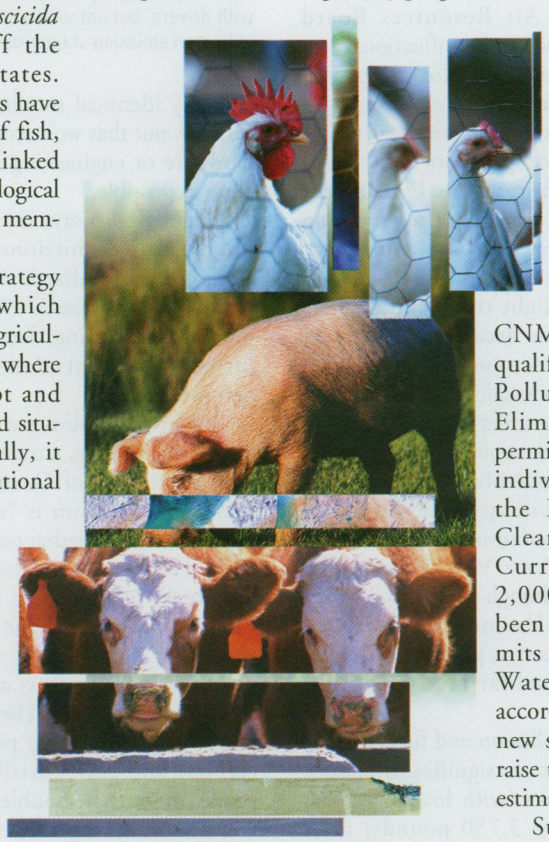
The study is now in its second phase. The Johns Hopkins team plans to assess whether continued exposure over two years will cause existing cataracts to grow, and whether the use of preventive measures will arrest growth.

New Rules for Feedlots

For livestock and poultry producers across the United States, the manure is hitting the fan. A September 1998 report entitled

Draft Unified National Strategy for Animal Feeding Operations, prepared jointly by the EPA and the U.S. Department of Agriculture (USDA), proposes an aggressive strategy to improve water quality and reduce public health risks associated with animal feeding operations (AFOs). The strategy is well timed. Approximately 35,000 river miles in the United States are currently polluted by runoff from livestock operations. Livestock wastes are flowing down the Mississippi River and contributing to an oxygen-depleted dead zone the size of New Jersey in the Gulf of Mexico. Poultry wastes have been implicated in toxic *Pfiesteria piscicida* infestations off the mid-Atlantic states. These infestations have killed millions of fish, and have been linked to human neurological effects including memory loss.

The draft strategy targets AFOs, which are defined as agricultural enterprises where animals are kept and raised in confined situations. Specifically, it establishes a "national expectation" that all AFOs will develop site-specific comprehensive nutrient management plans (CNMPs) by the year 2008. CNMPs prescribe measures such as feed management, as well as manure storage and land application procedures that AFO operators would be expected to follow to ensure that their feedlots meet clearly defined nutrient management goals. Operators looking for technical guidance in developing a CNMP will be able to turn to sources that include the Natural Resources Conservation Service of the USDA, the EPA, and certified specialists in the private sector. An additional source of information is the National Dialogue on Pork Production, a multiparty coalition of producers and state and federal regulatory agencies (including the EPA) that released a separate set of waste management guidelines entitled *Comprehensive Environmental Framework for Pork Production Operations* in December 1997.



Cleaner critters? The EPA and the USDA have proposed a strategy to reduce public health risks associated with animal feeding operations.

According to Jeff Lape, the AFO cochair representing the EPA in development of the strategy, smaller AFOs will develop CNMPs on a voluntary basis. However, concentrated AFOs, which are loosely defined as containing more than 1,000 animal units (the equivalent of 1,000 beef cattle, 700 dairy cows, 2,500 hogs, or 30,000 chickens), and other high-risk facilities will be required by regulation to develop CNMPs. "We estimate that there are 450,000 AFOs in the United States," says Lape. "Ninety-five percent of these are going to fall under voluntary programs. The rest will fall within a regulatory program."

Although the regulatory component of the strategy is still being developed, it is likely that the AFOs that fall into this category will be required to prepare a CNMP in order to qualify for a National Pollutant Discharge Elimination System permit, to be issued by individual states and the EPA under the Clean Water Act. Currently, around 2,000 facilities have been issued such permits under the Clean Water Act. However, according to Lape, the new strategy will likely raise that number to an estimated 20,000.

Susan Heathcote, research director for the Des Moines-based Iowa Environmental Council, is encouraged by the EPA and USDA's collaboration on the strategy, but adds that much of its success will be determined by actual environmental improvements, whether through voluntary or regulatory means. "Hopefully, if we're doing our job right," she says, "then we're going to see some improvement."

International Lab Established in Chornobyl

Early on the morning of 26 April 1986, two nearly simultaneous explosions at the V.I. Lenin Atomic Power Plant—soon to be known around the world as the Chernobyl nuclear power plant—released what the World Health Organization has estimated to be 200 times the combined radioactivity of the atom bombs dropped on Hiroshima and Nagasaki. Twelve years later, on 22 July 1998, Ukrainian and U.S. leaders signed an agreement to establish the International Radioecology Laboratory in Chornobyl (the city's recently adapted Ukrainian spelling).

The agreement developed from the ongoing work of Ron Chesser, a senior ecologist at the Savannah River Ecology Laboratory (SREL). The SREL is administered by the University of Georgia in Athens and funded by a cooperative agreement with the Department of Energy (DOE). The SREL performs ecological research at the DOE's Savannah River Site, a nuclear weapons materials processing facility in Aiken, South Carolina.

The new laboratory will be devoted to studying the effects of ionizing radiation on the plants and animals of the area surrounding the Chornobyl reactor. According to a 1996 International Atomic Energy Association/World Health Organization publication, *Ten Years after Chernobyl: What Do We Really Know?*, the only major public health effect of the Chornobyl accident noted to date has been an increase in thyroid cancer among children—up to 800 cases by the end of 1995. But the long-term human health effects of the accident are yet to be seen. By studying the wildlife of Chornobyl, scientists hope to assess the multigenerational effects of high doses of ionizing radiation, and to establish how organisms cope with the genetic damage sustained from such radiation.

The lab will enable scientists to perform, for the first time, long-term studies on the biological and genetic effects of varying amounts of radiation. "The lab is [unique] in the sense that we can study organisms that have lived through many life cycles in varying degrees of radiation," says Chesser. Other studies will look at how much of a given dose of radiation is absorbed by an organism, and at the mobility of radionuclides through soil, water, and biological systems. Chesser says, "It's a diverse set of topics we're addressing. There will be perhaps a dozen different studies looking at different aspects of genetics alone."

The lab's scientists will also evaluate the effectiveness of current cleanup strategies, such as the 800-plus radioactive waste burial pits surrounding the Chornobyl plant, and investigate new remediation techniques. Finally, the new lab will also enable scientists from around the world to consolidate and coordinate their efforts, and launch new studies or expand current ones.